

UNITED STATES MARINE CORPS
FIELD MEDICAL TRAINING BATTALION
Camp Lejeune, NC 28542-0042

FMST 403

Maintain Airway

TERMINAL LEARNING OBJECTIVE

1. Given a casualty in an operational environment, **manage respiratory trauma** to reduce the risk of further injury or death. (8404-MED-2003)

ENABLING LEARNING OBJECTIVES

1. Without the aid of reference, given a description or list, **identify standard medical terminology related to the airway**, within 80% accuracy, per Prehospital Trauma Life Support, Current Military Edition. (8404-MED-2003a)

2. Without the aid of reference, given a description or list, **identify the anatomy of the airway**, within 80% accuracy, per Prehospital Trauma Life Support, Current Military Edition. (8404-MED-2003b)

3. Without the aid of reference, given a description or list, **identify the signs and symptoms of a compromised airway**, within 80% accuracy, per Prehospital Trauma Life Support, Current Military Edition. (8404-MED-2003c)

4. Without the aid of reference, given a description or list, **identify treatments for a compromised airway**, within 80% accuracy, per Prehospital Trauma Life Support, Current Military Edition. (8404-MED-2003d)

OVERVIEW

Airway management plays a prominent role in the management of trauma patients. The failure to maintain oxygenation and ventilation causes secondary brain injury, compounding the primary brain injury produced by the initial trauma. Cerebral oxygenation and oxygen delivery to other parts of the body provided by adequate airway management and ventilation remain the most important components of prehospital patient care. Inability of the respiratory system to provide oxygen to the cells or inability of the cells to use the oxygen supplied results in anaerobic metabolism and can quickly lead to death.

1. AIRWAY TERMINOLOGY (see Figure 1)

Pharynx – Muscle lined with mucous running from the back of the soft palate to the upper end of the esophagus; divided into three sections

- Nasopharynx
- Oropharynx
- Hypopharynx

Nasal Septum – Separates the left and right airways of the nose

Nares – External openings of nasal cavity

Larynx (voicebox) – Cartilaginous box located above the trachea, containing vocal cords and muscles that make them work

Epiglottis – Leaf-shaped structure that acts like a gate, directing air into the trachea and solids/liquids into the esophagus

Trachea (windpipe) – Main trunk of the system of tubes air passes to and from the lungs

2. ANATOMY OF THE AIRWAY

Upper Airway

- Consists of the nasal cavity and oral cavity

Lower Airway

- Consists of the trachea, its branches and the lungs. On inspiration, air travels through the upper airway and into the lower airway. The actual gas exchange occurs in the alveoli. The alveoli are where the circulatory and respiratory systems meet.

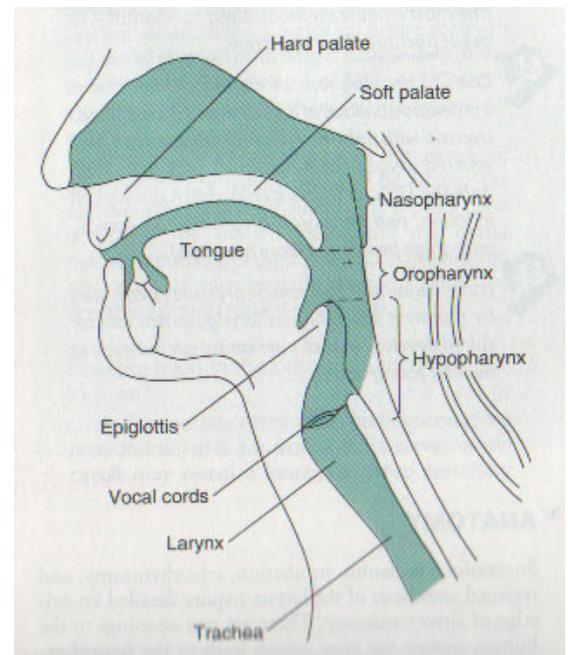


Figure 1. The Airway

3. SIGNS & SYMPTOMS OF AIRWAY COMPROMISE

There are many reasons that a person may lose their airway and/or stop breathing, but when battlefield trauma is involved it usually falls into one of two categories; decreased neurological function or mechanical obstruction. Trauma can affect the respiratory system's ability to adequately provide oxygen and eliminate carbon dioxide. The respiratory center of the brainstem is responsible for controlling and regulating the breathing process. The brain detects carbon dioxide (CO₂) and oxygen (O₂) levels in the bloodstream and then determines what changes need to happen in the body. It then sends nerve impulses, or messages, to the respiratory muscles telling them engage and begin another cycle of inhaling or exhaling. A traumatic brain or spinal injury can cause a breakdown in this process; preventing the brain from detecting and/or communicating with the respiratory and cardiovascular systems, which can stop the body's automatic drive to breathe. Hypoventilation, or inadequate ventilation in order to perform gas exchange, is one of the most common respiratory problems. If left untreated, hypoventilation results in CO₂ build-up, acidosis, and eventually death. Management involves improving the patient's ventilation rate and depth by correcting existing airway problems and assisting ventilation as appropriate.

Decreased Neurological Function

Decreased minute volume can be caused by two clinical conditions related to decreased neurological function:

- Flaccidity of the tongue
- Decreased level of consciousness

If a patient is supine, the base of the tongue will fall backward and occlude the hypopharynx. To prevent the tongue from occluding or to correct this problem when it occurs, maintaining an open airway must be assured in any supine patients with a diminished LOC, regardless of whether signs of ventilatory compromise exist. A decreased LOC will also affect ventilatory drive and may reduce the rate of ventilation, the volume of ventilation, or both.

Mechanical Obstruction

Another cause of decreased minute volume is mechanical airway obstruction. Airway obstruction on the battlefield is usually due to trauma, which can disrupt the anatomy or cause bleeding into the airway. Obstructions can be neurologically influenced (discussed above) or purely mechanical in nature. Foreign objects in the airway may be objects that were in the patient's mouth at the point of injury:

- Teeth
- Gum
- Tobacco
- Bone
- Blood
- Vomit

Outside objects may also threaten airway patency:

- Glass
- Rocks
- Debris

Management of mechanical airway obstructions can be extremely challenging. Foreign bodies may become lodged and create occlusions. Crush injuries and edema may be present. Patients with facial injuries often present with blood and vomit. Treatment of these problems is aimed at immediate recognition of the obstruction and the steps taken to ensure airway patency.

Assessment of the Airway

- Look for obvious injuries; continue to talk to the casualty
 - o Talking suggests an open airway
- Be aware of patient's LOC while in the supine position
- Patient may need to remain in the position found if they are maintaining their own airway in order to avoid aspiration

Conducting a Physical Examination

- Look
- Listen
- Feel, feel

Look

- Look at the casualty's face, neck, nose and lips for:
 - o Cyanosis or edema
 - o Any obvious injuries
 - o Blood or any debris
- Open the casualty's mouth and look for foreign objects or abnormalities
 - o Broken teeth
 - o Tobacco or food products
 - o Debris
- Look for bilateral, normal chest rise and fall during breathing
 - o Be aware of unilateral chest rise/fall
 - o Any paradoxical movement of the chest wall
- Look for use of accessory muscles and increased work of breathing

Listen

- Listen for the presence or absence of breath sounds

- Listen to the quality of the respirations
- Listen for any tachypnea or bradypnea
- Listen for the rhythm and depth of respirations
- Listen for any sounds signaling a compromise to the upper airway
 - Tongue occluding the hypopharynx causing a snoring sound
 - Blood or vomit causing gurgling noises
 - Any foreign bodies lodged in the airway

Feel, Feel

- Placing your hand on the casualty's chest and lowering your ear to their mouth provides you with multiple senses to check the respiratory system. In combat, one or more of these senses may be diminished due to explosions, gunfire, night operations, etc.
 - Feel for warm breath against your face when casualty exhales
 - Feel for equal chest rise and fall with your hand as casualty breathes

4. **TREATMENTS FOR A COMPROMISED AIRWAY**

Manual Maneuvers of the Airway

The tongue is connected to the mandible and moves forward with it. Any maneuver that moves the mandible forward will pull the tongue out of the hypopharynx. This can be accomplished using two different methods:

- Trauma Jaw Thrust
- Trauma Chin Lift

Manual Clearing of the Airway

The first step in airway management is a quick visual inspection of the oropharyngeal cavity. Foreign material or other objects may be found in the mouth of a trauma patient. These can be swept from the mouth using a finger, but should be avoided in low-light situations or when the object is lodged deep in the airway. Positioning the casualty on their side will allow gravity to assist in clearing any secretions or objects.

Nasopharyngeal Airway (NPA)

The NPA (see Figure 2) is a soft, rubberlike device that is inserted through one of the nares and then along the curvature of the posterior wall of the nasopharynx and oropharynx. This adjunct is used for both conscious and unconscious casualties who are unable to maintain their own airway. When inserted, this adjunct can cause bleeding.

Use an NPA under the following conditions:

- The casualty is unconscious or has a decreased level of consciousness.
- Manual airway maneuvers were unsuccessful and you could not open the airway.

□ The casualty is conscious but unable to maintain an open airway on his own.



Figure 2. Nasopharyngeal Airway

Do not use NPA if the casualty is conscious and breathing on his own, has a severe head or facial injury, or if there is evidence of a basilar skull fracture such as bruising around the eyes (raccoon eyes), bruising behind the ears, or blood or fluid coming out of the ears.



Figure 3. Inserting a Nasopharyngeal Airway

A nasopharyngeal airway (NPA) is an effective means to mechanically maintain a patent airway in both conscious and unconscious casualties. Unlike many other airway adjuncts, it has proven tolerable even for individuals who may still have an intact gag reflex provided that it is sized properly. You should have two different sizes in your Corpsman Assault Pack, one that is 6.5 mm and one that is 5.5 mm. Before inserting the device, make sure you select the NPA that best fits the casualty's nostril and airway. (see Figure 3)

Step 1: Select the largest nostril for insertion and assess it for any potential obstructions.

Step 2: Determine what size NPA is needed by measuring it against the distance between the corner of casualty's nose and his ear. The NPA must be long enough to enter the airway.

Step 3: Lubricate the NPA to make insertion easier. The NPA comes with a packet of water-based lubricant. If this is not available, you may be able to use the casualty's saliva.

Step 4: Insert the NPA into the selected nostril in a front to back direction, along the floor of the nasal cavity. Do not insert it upwards in the direction of the brain. If you meet resistance, gently roll the NPA between your fingers to get past the obstruction. Do not

try to force the device into the airway. If resistance continues, remove the NPA, re-lubricate it, and try to insert it again in the other nostril.

Step 5: Stop inserting NPA once the flared end is resting against the nostril or when the casualty gags, in which case you should withdraw the NPA slightly until the gag reflex is not stimulated.

Remember:

No Airway Management in Care Under Fire

Tactical Field Care:

For unconscious casualties without airway obstruction:

- open the airway using the trauma jaw thrust or the trauma chin lift
- Place a nasopharyngeal airway then,
- place the casualty in the recovery position.
- Reassess as necessary.

For a casualty with an airway obstruction or an impending airway obstruction:

- open the airway using the trauma jaw thrust or the trauma chin lift
- Clear the airway of the obstruction, if possible.
- Place a nasopharyngeal airway, if not contraindicated by the casualty's condition.
- Allow the casualty to assume any position that best protects the airway, to include sitting up.
- If at any time the casualty's airway becomes completely obstructed, perform a surgical cricothyroidotomy (with lidocaine if conscious). This procedure will be covered in depth during the lesson on Cricothyroidotomy.

Tactical Evacuation Care:

For unconscious casualties without airway obstruction:

- open the airway using the trauma jaw thrust or the trauma chin lift
- Place a nasopharyngeal airway then,
- place the casualty in the recovery position.
- Reassess as necessary.

For a casualty with an airway obstruction or an impending airway obstruction:

- open the airway using the trauma jaw thrust or the trauma chin lift
- Clear the airway of the obstruction, if possible.
- Place a nasopharyngeal airway, if not contraindicated by the casualty's condition.
- Allow the casualty to assume any position that best protects the airway, to include sitting up.
- If above measures unsuccessful:
- **Supraglottic airway or**
- Endotracheal intubation or
- Surgical cricothyroidotomy (with lidocaine if conscious)

5. SUPRAGLOTTIC AIRWAY

King Laryngeal Tracheal Tube (King LT airway)

The King LT (see Figure 4) is a single lumen, blindly inserted airway created as an alternate to tracheal intubation or mask ventilation, resulting in minimal airway trauma with little training necessary. The King airway consists of a curved tube with ventilation openings located between two inflatable cuffs. A single valve/pilot balloon is used to inflate both cuffs. The distal cuff seals the esophagus; the proximal cuff seals the oral pharynx. Both cuffs are high-volume, low-pressure cuffs. A 15-mm adaptor attaches to the proximal end of the tube for attachment to a standard breathing circuit or resuscitation bag.

This adjunct is used only for unconscious patients, as the presence of an intact gag reflex may cause gagging or vomiting when inserted. The King LT-D does not protect the airway from regurgitation and aspiration effects. Therefore, this airway is contraindicated in casualties who are responsive with an intact gag reflex. Additionally, it should not be used in casualties who have airway burns (from flames or from caustic substances).



Figure 4. King LT

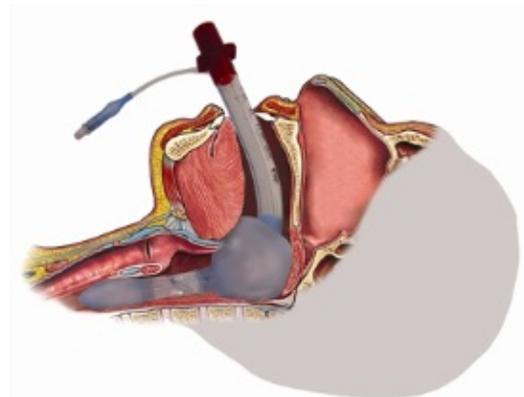


Figure 5. King LT inserted

Insertion

1. Apply chin lift and introduce the King tube into the corner of the mouth.
2. Advance tip under base of tongue, while rotating tube back to midline.
3. Without exerting excessive force, advance tube until base of connector is aligned with teeth or gums.
4. Inflate cuff according to package reference or volume noted on tube. (Size 3 – 50 mL, Size 4 – 70 mL, Size 5 – 80 mL)
5. Attach resuscitator bag. While gently bagging, slowly withdraw tube until ventilation is easy and free flowing (large tidal volume with minimal airway pressure).



CASUALTY ASSESSMENT AND AIRWAY MANAGEMENT

Care Under Fire Phase: Treatment of the airway is deferred during this phase of care.

Tactical Field Care Phase: During this phase, reassess your treatment performed during Care Under Fire Phase to control the hemorrhage. Don BSI. Assess the airway and intervene if necessary. Use the least invasive airway that will provide treatment. Monitor breathing and look for signs and symptoms of airway compromise. Reassess all care provided. Document care given, prevent hypothermia, and TACEVAC.

REFERENCE:

Pre-Hospital Trauma Life Support, current military edition

Maintain Airway Review

1. Identify the three sections of the pharynx.
2. Identify four types of mechanical airway obstructions.
3. Identify the two manual airway maneuvers.
4. Identify the main contraindication for using a King LT airway.